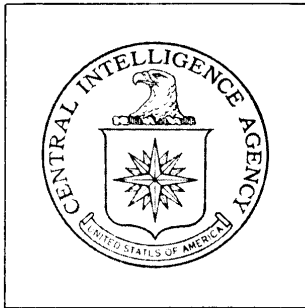


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DIRECTORATE OF
INTELLIGENCE

**Industrial Facilities
(Non-Military)**

Basic Imagery Interpretation Report

Ufa Petroleum Refinery Novo Ufimskiy

Ufa, USSR



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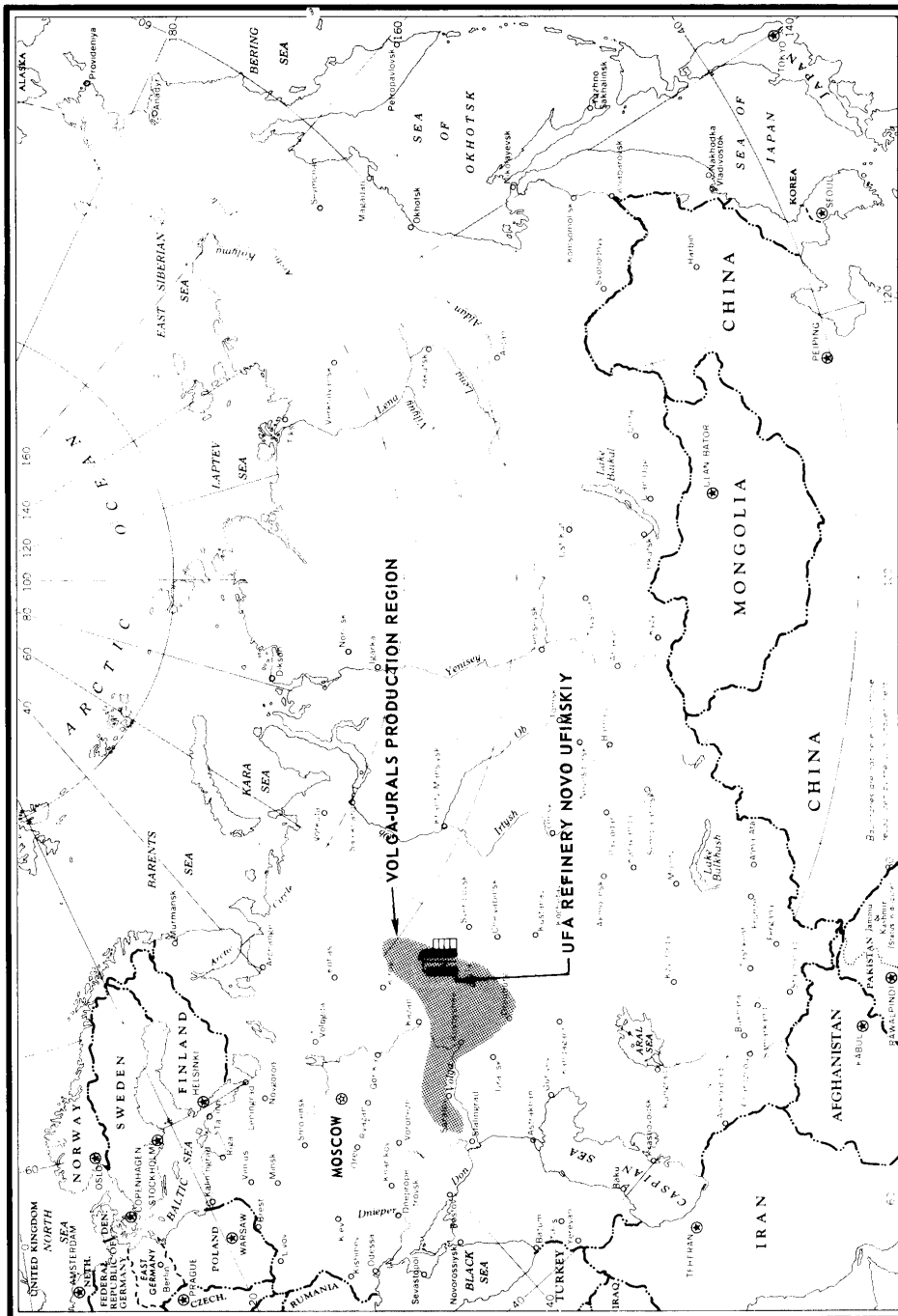
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FIGURE 1. LOCATION MAP.

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INTRODUCTION

The Ufa Petroleum Refinery Novo Ufimskiy is located on the east bank of the Belaya River approximately 10 nautical miles (nm) northeast of Ufa. This refinery is the largest of the three located in the Ufa area and ranks in the top five Soviet refineries with respect to charge capacity. The two other refineries in the area are the newer Ufa Petroleum Refinery Novo Chernikovsk [] which is located about 1 nm to the north, and the older Ufa Petroleum Refinery Staro Ufimskiy [] which lies immediately to the south. A petrochemical plant, the Ufa Synthetic Alcohol Plant [] is immediately east of the refinery and is connected to it by pipeline.

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Construction of the Ufa Novo Ufimskiy Refinery was begun in 1947 and the first units were placed in operation in mid-1951. 1/ Expansion of facilities was started in 1953, and by 1956 the plant had reached its designed charge capacity. 2/ There have been some changes in facilities during the 1960's, but these are for secondary processing and would influence the quality and variety of products rather than the rated capacity. The capacity could have been increased by internal modifications of primary distillation equipment, but this would not be apparent on photography.

Crude oil for this refinery is received by pipeline and railroad from the Bashkiria and Tataria ASSR's which lie within the Volga-Ural production region. 3/ (See Figure 1.) Products are shipped from the refinery by pipeline, railroad, and waterway. 4/ Rail services are provided by spurs from the Ufa-Chelyabinsk main line.

Electric power for the refinery is produced by the collocated Ufa Heat and Thermal Power Plant Novo Chernikovsk TETS 4 []

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Large-scale photography from May and August 1969 provides the basis for most of the identifications presented in this report.

BASIC DESCRIPTION

Physical Features

This refinery covers an irregularly shaped area which measures approximately 11,500 by 5,900 feet and contains about 1,230 acres (see Figures 2 and 3). The area is secured by wall. As in other Soviet refineries, the various processing units are more widely separated than is considered necessary under US standards. The refinery utilizes small, standardized units to obtain the desired capacities rather than larger, specially designed units. This practice is characteristic of Soviet refinery design and construction.

Operational Functions

The major processing units presently constructed and in operation at this refinery include primary crude oil distillation units, thermal and catalytic cracking units, possible thermal and catalytic reformers, alkylation and possible polymerization facilities, a delayed coking unit, possible petrochemical feedstock extraction units, various crude oil and products treating facilities, and light-ends recovery and gas fractionating equipment. Also, there is a complete lubricating oil plant with phenol extraction, deasphalting, dewaxing, and probable clay treatment units.

The products of this refinery include straight-run, cracked and blended gasolines, kerosene, diesel and fuel oils, petroleum coke, asphaltic materials, waxes, lubricating oils, gaseous hydrocarbons, and petrochemical feedstocks.

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ZSAIConstruction and Operational Status

The earliest photography used in this study is from April 1962. At that time, the refinery was complete and in operation and no significant construction activity was in progress. Since that time there has been some dismantling of older facilities and replacement by new units. In addition, the water cooling, treatment, and storage facilities have been increased.

Between April 1962 and September 1964 there were no significant changes in the refinery. In September 1964, additional water cooling and treating facilities were in the early stages of construction. By May 1965, part of the water handling facilities had been completed and possible desulfurization and sulfur recovery facilities appeared to be in the mid-stages of construction.

In August 1966, construction had just begun on an unidentified processing unit on the eastern edge of the refinery (Area C7, Figure 3) and the possible desulfurization and sulfur recovery units were complete.

In June 1967, a small processing unit in the chemical treating area was partially dismantled. Work was continuing at a moderate rate on the water cooling and handling facilities.

By August 1968, the water cooling and handling facilities were essentially as shown in Figure 3. A small group of storage tanks had been dismantled and the earth work had begun in preparation for the construction of a large combination secondary processing unit (Area F). A possible hydroforming unit had been partially dismantled and was being converted to a possible desulfurizing and reforming combination unit. This conversion was nearly complete by August 1969. The unidentified processing unit on the eastern edge of the refinery was in a late stage of construction and the large combination unit was in the early-to-mid stages in August 1969.

In January 1970, the latest coverage used in this study, much of the refinery was obscured by vapor and smoke, but it was observed that construction was continuing at least on the large combination unit.

The refinery was in operation on all coverage used for this report.

Facilities and Equipment

The following table lists the functional areas and equipment within the refinery. All items in this table are keyed to Figure 3. In areas which are still under construction and whose function is undetermined, buildings and processing equipment are not listed in Table 1 or shown on the line drawing. All measurements presented have been rounded to the nearest half-meter.

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Table 1. Equipment and Facilities at the Ufa Petroleum Refinery Novo Ufimskiy
(keyed to Figure 3)

<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>	
A	Storage, Shipping and Support		
	(1) Products Shipping and Storage	10 Miscellaneous buildings 2 Loading racks (1 covered) 143 Cylindrical storage tanks 18 24-meter-diameter 6 12-meter-diameter 6 [redacted] 50 9-meter-diameter 28 [redacted] 19 6-meter-diameter 16 3-meter-diameter 23 Horizontal storage tanks 3 15-meter-long 10 [redacted] 6 12-meter-long 4 [redacted]	25X1 25X1 25X1 25X1
	(2) Storage	12 Storage buildings	
	(3) Support	8 Miscellaneous buildings 1 Separately secured motor pool with 6 maintenance and support buildings	
B	Lubricating Oil Production		
	(1) Probable Clay Treatment	2 Processing units, each containing 1 large processing building with high section for clay towers, 5 settling/filter tanks, 8 treating/storage tanks, 2 small pipe furnaces, and 1 support building. One unit has 3 process towers (absorbers/extractors) and 3 cylindrical storage tanks (3-meter-diameter). The other unit has 4 processing towers and 4 storage tanks (3-meter-diameter).	
	(2) U/I Processing	1 Cluster of processing equipment (includes towers in scaffolding and at least 6 settling tanks) 1 Bank of cooling coils/heat exchangers 1 Processing building with high section 1 Processing/pump building 1 Control building 1 Support building 1 Cylindrical storage or treatment tank, [redacted] [redacted]	25X1 25X1
	(3) Treating, Blending, Packing and Shipping	1 Large building (150 by 84 meters) with 11 batch agitators/blending tanks protruding through roof and 1 attached to building 1 Shipping building with 6 associated elevated blending/loading tanks 1 Small pipe furnace 5 Miscellaneous buildings 4 Cylindrical storage tanks 2 6-meter-diameter 2 3-meter-diameter 1 Horizontal tank, 12 meters long	

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Area	Functional Description	Equipment and Facilities	
	(4) Deasphalting	2 Deasphalting units, each containing 1 row of 4 columns (1 deasphalting tower and 3 stripping towers), 1 evaporator building, 1 pump/control building, 1 support building, 1 pipe furnace, 3 horizontal propane storage tanks (not measured) and one unit with 6 cylindrical tanks and the other unit with 4 cylindrical tanks (each 3 meters in diameter) 1 Processing/treating building with 1 horizontal storage/settling tank (15 meters long)	
	(5) Dewaxing	4 Dewaxing units, each containing 2 large processing/pump and control buildings, 1 cluster of processing equipment, 2 cooling coils, 1 support building, and 1 probable treating tank (6 meters in diameter) 1 U/I processing unit with 2 clusters of equipment, 1 row of 4 processing towers, 2 processing buildings with attached processing equipment and 1 control building 1 Probable solvent recovery unit with 3 columns, 1 pipe furnace, 1 pump building, 1 cooling coil, 3 horizontal tanks (not measured) 22 Miscellaneous buildings 4 Cylindrical storage tanks 1 15-meter-diameter 3 12-meter-diameter 8 Horizontal storage tanks, [redacted]	25X1
	(6) U/I Processing	1 Unit with cluster of tall columns in scaffolding 1 Row of processing columns/towers, 1 processing building with accumulators on roof, 1 small furnace/heater, 1 control building, 1 support building, and 2 horizontal tanks (12 meters long) 4 Miscellaneous buildings 4 Cylindrical storage tanks, [redacted] 1 Oil-water separator/water treatment reservoir	25X1 25X1
	(7) Products and Intermediates Storage	2 Support buildings 76 Cylindrical storage tanks 24 12-meter-diameter [redacted] 18 9-meter-diameter [redacted] 4 6-meter-diameter [redacted] 2 3-meter-diameter [redacted] 1 Water storage basin	25X1 25X1 25X1
	(8) Phenol Extraction	5 Extraction units, each containing 2 groups of at least 3 columns each, 1 pump building, 2 pipe furnaces, 1 bank of cooling coils, 1 support building and 4 horizontal tanks [redacted] Four units have 3 cylindrical tanks (3 meters in diameter) and one unit has 2 cylindrical tanks (3 meters in diameter) 1 Support building	25X1

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<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>	
C	Storage and Possible Crude Oil Desalting		
	(1) Possible Desalting	2 Units, each with 1 large processing building 2 Banks of cooling coils 1 Cluster of processing equipment 2 Mixing/treating towers 2 Blending or storage tanks, [REDACTED] [REDACTED] 4 Horizontal storage tanks, 15 meters long 2 Support buildings 1 U/I processing or treating unit with 1 cluster of processing equipment (at least 1 possible fractionator) 1 cooling coil and 1 L-shaped building	25X1 25X1
	(2) Crude Oil Storage	2 Support buildings 25 Cylindrical storage tanks 18 24-meter-diameter [REDACTED] 1 Small storage tank base	25X1
	(3) Possible Desalting	3 Units, each with 1 large processing building 3 Banks of cooling coils 2 Clusters of process equipment 4 Mixing/treating towers 1 Blending or storage tank, [REDACTED] [REDACTED] 4 Cylindrical storage tanks [REDACTED] [REDACTED] 2 Spherical tanks, 12 meters in diameter 4 Horizontal storage tanks, [REDACTED] 2 Support buildings	25X1 25X1 25X1 25X1 25X1
	(4) Water Treatment and Storage	3 Miscellaneous buildings 5 Cylindrical storage tanks 3 9-meter-diameter [REDACTED] 2 [REDACTED] 6 Water storage and treatment basins 1 Oil-water separator/storage reservoir	25X1
	(5) Intermediates and Products Storage	4 Miscellaneous buildings 55 Cylindrical storage tanks 12 [REDACTED] 10 12-meter-diameter 33 9-meter-diameter	25X1
	(6) Crude Oil and Intermediates Storage	3 Support buildings 17 Cylindrical storage tanks 8 24-meter-diameter 2 21-meter-diameter 3 [REDACTED] 3 [REDACTED] 1 [REDACTED] 1 Water storage basin	25X1
	(7) U/I Processing Unit U/C	Late stage of construction	
D	Primary Crude Oil Distillation	1 Multistage distillation unit with 5 columns (1 vacuum, 1 atmospheric and 3 other columns), 1 bank of accumulators, 2 banks of heat exchangers/cooling coils, 1 pipe furnace, 1 pump and control building, 2 cylindrical tanks (3 meters in diameter) and 4 horizontal tanks (two 12 meters long and two not measured)	25X1

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Area	Functional Description	Equipment and Facilities
		<p>1 Multistage distillation unit with at least 5 columns (1 vacuum, 2 atmospheric and 2 other columns), 1 bank of accumulators, 2 banks of heat exchangers/cooling coils, 1 pipe furnace, 1 pump and control building, 2 cylindrical storage tanks (3 meters in diameter) and 3 horizontal tanks (one 12 meters long and two not measured)</p> <p>1 Multistage distillation unit with 6 columns (1 vacuum, 2 atmospheric and 3 other columns), 1 cluster of U/I processing equipment, 2 banks of heat exchangers/accumulators, 2 pipe furnaces, 1 pump and control building, 1 treating building with 5 desalting/treating drums, 1 support building and 2 cylindrical storage tanks (3 meters in diameter)</p> <p>9 Miscellaneous buildings</p>
E	Thermal Cracking	<p>3 Cracking units, each with a row of 4 columns (flash tower, reactor, fractionator and stabilizer), 2 pipe furnaces, 1 pump and control building, 2 cooling coils, 1 support building with 2 horizontal tanks (7.5 meters long) and a vapor recovery unit with 1 column, 1 small cooling coil and 1 compressor building</p> <p>2 Support buildings</p>
F	U/I Combination Secondary Processing Unit U/C	Midstage of construction
G	Catalytic Cracking	<p>3 Thermoform (moving-bed) catalytic cracking units, each with a reactor, a regenerator and a catalyst hopper in scaffolding, 1 blower building with 3 blowers, 1 pipe furnace, 1 fractionator, 1 stabilizer column, 1 bank of cooling coils/accumulators, 1 extractor (vapor recovery), 1 compressor/pump building, 1 control building, 2 support buildings and 5 cylindrical tanks [redacted] and three 3 meters in diameter)</p> <p>4 Miscellaneous support buildings</p>
H	Gas Processing and Waste Gas Disposal	<p>1 Probable light-ends recovery and gas fractionation unit with 3 fractionators/extractors, 3 possible drying columns or absorbers, 1 U/I tower, 1 cluster of U/I processing equipment, 1 bank of cooling coils, 2 compressor and control buildings, 1 building with 2 treating drums, 1 support building, 1 cylindrical tank [redacted] and 5 horizontal tanks/accumulators (not measured)</p> <p>1 Separately secured transformer substation with 1 building</p> <p>6 Miscellaneous buildings</p> <p>1 Gasholder, 21 meters in diameter</p> <p>1 Gasholder U/C</p> <p>1 Horizontal tank, 9 meters long</p> <p>1 Flare tower</p>

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Area	Functional Description	Equipment and Facilities
I	Possible Desulfurizing and Sulfur Recovery	<ul style="list-style-type: none"> 1 Unit with 4 large-diameter reaction vessels/precipitators, 2 processing towers, 5 clusters of U/I equipment, 3 horizontal processing drums and 1 processing and control building 1 U/I unit with 2 clusters of columns (each with at least 4), 1 bank of accumulators, 1 compressor/pump and control building, 3 horizontal tanks (one 12 meters long and two not measured) 1 U/I unit with a cluster of 4 columns, 1 bank of heat exchangers/accumulators, 1 processing and control building with equipment on roof and 2 horizontal tanks (9 meters long)
J	Secondary Processing (1). Possible Hydro-forming	<ul style="list-style-type: none"> 1 Unit with 2 processing columns, 1 pipe furnace, 3 banks of heat exchangers/accumulators, 1 pump building, 2 horizontal tanks (12 meters long) and 2 support buildings 1 Unit with 1 processing building and a row of 4 columns, 1 bank of heat exchangers, 1 pump building and 2 horizontal tanks (12 meters long)
	(2) Possible Desulfurizing and Reforming	<ul style="list-style-type: none"> 1 Unit with 2 rows of columns (4 in one row and 3 in the other), 1 pump building, 1 control building and 3 pipe furnaces 1 Unit with 1 processing building with accumulators on roof and 5 attached columns, 1 pump building and 1 support building 1 Probable treating building with 7 horizontal drums 1 Support building
K	Alkylation	<ul style="list-style-type: none"> 2 Alkylation units, each containing 1 processing building with 7 horizontal reactor/settling/washing drums, 1 row of 4 columns, 6 drying/absorber towers, 1 bank of heat exchangers/cooling coils, 1 pump/compressor building, 4 support buildings (1 with possible treating drum), and 2 horizontal storage tanks (15 meters long). One unit has 3 short treating towers. 7 Support buildings 6 Horizontal storage tanks, 12 meters long 1 Water storage/separator reservoir
L	Water Treatment, Cooling and Storage	<ul style="list-style-type: none"> 38 Miscellaneous buildings 20 Cooling towers <ul style="list-style-type: none"> 2 20-cell units 3 14-cell units 4 5-cell units 4 4-cell units 4 3-cell units 2 2-cell units 1 7-cell unit being expanded to 14-cell 1 Separately secured area with 4 buildings 5 Buildings U/C 2 Flare towers 6 Cylindrical storage tanks <ul style="list-style-type: none"> 4 2 6-meter-diameter 2 Gasholders, 21 meters in diameter 2 Horizontal tanks, 12 meters long 35 Water storage and treating reservoirs and basins

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Area	Functional Description	Equipment and Facilities	
M	Primary Crude Oil Distillation		
	(1) Water Cooling and Storage	3 Miscellaneous buildings 3 Cooling towers 2 10-cell units 1 5-cell unit 5 Water treatment/separator reservoirs and basins	
	(2) Primary Distillation	3 Distillation units, each containing 3 fractionating columns, 1 bank of heat exchangers/cooling coils, 1 pump and control building and 1 pipe furnace 1 Distillation unit with 5 columns (1 vacuum, 1 atmospheric and 3 others), 1 bank of heat exchangers/accumulators, 1 bank of cooling coils, 1 pump and control building, 1 pipe furnace, 2 support buildings, 2 cylindrical tanks (3 meters in diameter) and 2 horizontal tanks 5 Miscellaneous buildings	25X1
	(3) Possible Desalting	4 Units, each with 1 large processing building 2 Banks of condensers/accumulators 1 Cluster of processing equipment 2 Support buildings 4 Cylindrical storage tanks 3 [redacted] 1 3-meter-diameter 6 Horizontal tanks 4 12-meter-long 2 6-meter-long	25X1
N	Products and Intermediates Storage	14 Support buildings 57 Cylindrical storage tanks 17 24-meter-diameter 10 15-meter-diameter 4 12-meter-diameter 24 9-meter-diameter 2 [redacted] 6 Spherical tanks, 12 meters in diameter 22 Horizontal storage tanks 19 15-meter-long 3 12-meter-long 1 Base for cylindrical tank	25X1
O	Primary Crude Oil Distillation	4 Multistage distillation units, each containing 5 columns (1 vacuum, 1 prefractionator, 1 atmospheric and 2 stabilizers), 2 banks of heat exchangers/accumulators, 1 pump and control building, 1 support building and 1 pipe furnace 1 Support building 8 Cylindrical storage tanks, 3 meters in diameter 11 Horizontal tanks 7 12-meter-long 4 6-meter-long	
P	Thermal Cracking	4 Cracking units, each containing a row of 4 columns (flash tower, reactor, fractionator and stabilizer), 2 pipe furnaces, 1 pump and control building, 2 cooling coils, 1 support building with 2 horizontal tanks [redacted] and a vapor recovery unit with 1 column, 1 small cooling coil and 1 compressor building	25X1

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Area	Functional Description	Equipment and Facilities	
		1 Processing building with 3 attached columns and 1 horizontal tank (12 meters long) 3 Cylindrical storage tanks, 3 meters in diameter 7 Support buildings	
Q	Intermediates and Products Storage	11 Miscellaneous buildings 65 Cylindrical storage tanks 25 12-meter-diameter 12 9-meter-diameter 9 [redacted] 4 6-meter-diameter 3 [redacted] 12 3-meter-diameter 40 Horizontal storage tanks 26 15-meter-long 9 12-meter-long 5 [redacted] 1 Water storage basin 2 Probable covered water storage reservoirs	25X1 25X1 25X1
R	Possible Polymerization	2 Possible polymerization units, each containing 1 row of 4 columns, 2 clusters of processing equipment, 1 bank of cooling coils, 2 pump/compressor buildings, 2 miscellaneous buildings and 2 small pipe furnaces 4 Support buildings	
S	Possible Extraction (Petrochemical Feedstock)	2 Units, each containing 4 tall, thin extractors and 1 other column, 1 compressor and control building, 3 support buildings, 1 bank of cooling coils and 5 horizontal storage drums (not measured). One unit has 1 additional processing column and the other has 2 additional horizontal drums 1 Support building 1 Horizontal storage tank, 9 meters long	
T	Administration and Support	38 Miscellaneous buildings	
U	Thermal Conversion	1 Possible thermal reform unit with 1 possible reactor and 1 other processing column, 2 banks of heat exchangers/cooling coils, 1 pump and control building, 1 pipe furnace, 2 cylindrical storage tanks (3 meters in diameter) and 1 horizontal tank (12 meters long) 1 Possible liquid-phase, selective cracking unit with 3 columns (possible reactor, flash tower and fractionator), 1 pump and control building, 2 cooling coils, 1 pipe furnace, 3 cylindrical storage tanks (3 meters in diameter) and 3 horizontal tanks [redacted] [redacted]	25X1 25X1
V	Treating (1) Chemical Treating	4 Mixing towers, each with 1 horizontal settling drum 1 Building containing 6 batch agitators 2 Cylindrical blending/settling tanks 1 Control building 4 Support buildings 3 Horizontal storage tanks 1 [redacted] 2 9-meter-long	25X1

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Area	Functional Description	Equipment and Facilities	
	(2) Probable Chemical Treating	8 Mixing/agitator towers 1 Cluster of U/I processing equipment 1 Processing building with 6 horizontal settling/treating drums 3 Cylindrical storage tanks, 9 meters in diameter 2 Spherical tanks, 12 meters in diameter 4 Horizontal tanks 2 15-meter-long 2 12-meter-long	
	(3) Fractionating	1 Unit with 1 large fractionator and 2 other columns, 3 cooling coils/banks of accumulators, 1 pump and control building and 1 pipe furnace 1 Unit (partially dismantled) with 1 building and 3 short processing towers 1 Horizontal tank, 15 meters long	
W	Delayed Coking	3 Coking drums 1 Fractionating column 1 Pipe furnace 1 Pump building 10 Miscellaneous buildings 1 Overhead crane 1 Cooling tower with 8 cells 10 Cylindrical storage tanks 4 3 3 3-meter-diameter 1 Gasholder, 24 meters in diameter 1 Horizontal tank, 12 meters long 1 Water treatment/separator reservoir	25X1
X	Shipping and Storage (1) Shipping and Receiving	22 Miscellaneous buildings 1 Building U/C or being dismantled 3 Loading racks 6 Cylindrical storage/treating tanks 2 4 3-meter-diameter 5 Horizontal storage tanks, 15 meters long	25X1
	(2) Crude Oil and Products Storage	9 Miscellaneous buildings 50 Cylindrical storage tanks 9 33-meter-diameter 1 27-meter-diameter 32 24-meter-diameter 7 12-meter-diameter 1 3 Horizontal storage tanks, 15 meters long 1 Circular tank base	25X1

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